

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (Currently Amended): A packet transfer method comprising the steps of:
causing a transmission-source access network to generate a packet to be transferred to a destination access network, and to transmit the packet to a transmission-source packet transfer apparatus connected to said transmission-source access network;

causing said transmission-source packet transfer apparatus to convert the packet transmitted from said transmission-source access network into a superpacket having a length n times (n is an integer of not less than 2) larger than a fixed-length cell, said superpacket serving as a switching unit of relay means arranged on a network ~~serving as a backbone~~, and to send the superpacket to said network;

causing said network to relay the superpacket using said relay means, and to transfer the superpacket to a destination packet transfer apparatus connected to said destination access network; and

causing said destination packet transfer apparatus to reassemble the packet generated by said transmission-source access network on the basis of the superpacket transferred from said network and to send the packet to said destination access network.

2. (Currently Amended): A method according to claim 1, further comprising:

causing said transmission-source packet transfer apparatus to individually store the transmitted packets by in units of their respective destination transfer apparatuses, forming the superpacket for each of said destination packet transfer apparatuses, and sending the superpacket to said network, and

causing said destination packet transfer apparatus to individually store the superpackets transferred from said network by their respective in units of transmission-source packet transfer apparatuses and reassembling the packet for each of said transmission-source packet transfer apparatuses.

3. (Currently Amended) A method according to claim 2, further comprising:

causing said transmission-source packet transfer apparatus to detect for each of said destination packet transfer apparatus that the superpacket is not formed for a first time-out time, and

if a packet is stored in association with said destination packet transfer apparatus and the superpacket is not formed for said first time-out time without construction, causing said transmission-source packet transfer apparatus to form the superpacket from the packet and to send the superpacket to said network.

4. (Currently Amended) A method according to claim 2, further comprising:

causing said destination packet transfer apparatus to detect for each of said transmission-source packet transfer apparatus that the packet is not reassembled for a second time-out time, and

if a superpacket is stored in association with said transmission-source packet transfer apparatus without reassembly for said second time-out time, causing said destination packet transfer apparatus to discard the superpacket.

5. (Currently Amended) A method according to claim 1, further comprising

when the packet transmitted from said transmission-source access network crosses a plurality of superpackets, causing said transmission-source packet transfer apparatus to divisionally send the packet to said network using the plurality of superpackets, and

when the packet ~~in the superpacket is~~ transferred from said network ~~crosses in a~~ said plurality of superpackets, causing said destination packet transfer apparatus to ~~connect~~ reassemble the original packet generated by said transmission-source access network by connecting said plurality of superpackets and send the packet to said destination access network.

6. (Original) A method according to claim 1, further comprising:

causing said transmission-source packet transfer apparatus to store, as a transmission-source address and destination address in a header of the superpacket, unique network addresses defined only in said network and assigned to said transmission-source packet transfer apparatus and said destination packet transfer apparatus, respectively, and send the superpacket to the network, and

causing each relay means in the network to look up the header of the transferred superpacket to specify a relay destination of the superpacket in accordance with the network address assigned to said destination packet transfer apparatus and transfer the superpacket to said destination packet transfer apparatus.

7. (Currently Amended) A packet transfer apparatus for transferring a packet between an access network for transmitting/receiving the packet and a network serving as a backbone having relay means for relaying the packet, comprising:

forming means for converting the packet into a superpacket having a length n times (n is an integer of not less than 2) larger than a fixed-length cell, said superpacket serving as a switching unit of said relay means, and sending the superpacket to said network; and

reassembler means for extracting the packet from the superpacket sent from said network and sending the packet to said access network.

8. (Currently Amended) An apparatus according to claim 7, wherein said forming means comprises first storage means having queues for storing the packets ~~in units of packet transfer~~ apparatuses arranged between said network and an access network as a destination of the packet, wherein stores the packets are stored by their respective packet transfer destination apparatus in the queues ~~in units of destinations~~, and wherein said forming means detects that the number of the stored packets in number necessary for formation of the superpacket are stored, and when the number of stored packets is sufficient for forming the superpacket, said forming means extracts the packets from the queue to form the superpacket.

9. (Currently Amended) An apparatus according to claim 8, wherein said ~~construction~~ forming means further comprises:

for each of said queues ~~on~~ of said first storage means, first time count means for starting time counting every time the superpacket is formed and detecting an elapse of a first time-out time from the time count start time, and

when the elapse of the first time-out time is detected, said forming means forms the superpacket from the packets stored in the queue.

10. (Original) An apparatus according to claim 9, wherein the first time-out time is determined on the basis of a predetermined minimum band for each traffic on said network.

11. (Original) An apparatus according to claim 9, wherein the first time-out time is determined on the basis of a predetermined allowable network delay time for each traffic on said network.

12. (Currently Amended) An apparatus according to claim 7, wherein said reassembler means comprises second storage means having queues for storing the superpackets, wherein said superpackets are stored by their respective packet transfer source apparatus in units of packet transfer apparatuses arranged between said network and a transmission source access network, stores the superpacket in the queue, and wherein said reassembler means reassembles the packet from the stored superpacket.

13. (Currently Amended) An apparatus according to claim 12, wherein said reassembler means comprises, for each queue on said second storage means, second time count means for starting to count time counting every time the packet is reassembled and for detecting an elapse of a second time-out time from the time count start time, and when the elapse of the second time-out time is detected, discards the superpacket staying from in the queue.

14. (Currently Amended) An apparatus according to claim 13, wherein the second time-out time is determined on the basis of a predetermined minimum band or maximum allowable

value of at least one of a network delay for each traffic on said network, delay distribution time in said network, and predetermined protection time.

15. (Original) An apparatus according to claim 7, wherein said forming means detects that the packet crosses a plurality of superpackets and divisionally stores the packet in the plurality of superpackets, and said reassembler means detects that the packet on the superpacket crosses a plurality of superpacket and links packet data divisionally stored in the plurality of superpackets to reassemble the original packet generated by said transmission-source access network.

16. (Original) An apparatus according to claim 7, wherein the superpacket stores single packet occupation information representing whether a payload of the superpacket is occupied by data of a single packet,

 said forming means compares a length of each packet with a length of the payload of the superpacket and sets the single packet occupation information to occupation ON or occupation OFF in accordance with a comparison result, and

 said reassembler means detects that the single packet occupation information on the superpacket represents occupation ON and links packet data on a series of superpackets until an arrival of the superpacket with the single packet occupation information representing occupation OFF to reassemble the original packet generated by said transmission-source access network.

17. (Original) An apparatus according to claim 7, wherein a header of the superpacket has the same format as that of a header of the packet.

18. (Currently Amended) A packet communication system comprising:

an access network for transmitting/receiving a packet;

~~said-a~~ packet transfer apparatus for transmitting/receiving the packet of claim 7;

relay means for relaying the packet; and

a network serving as a backbone for transferring a superpacket having a length n times (n is an integer of not less than 2) larger than a fixed-length cell, said superpacket serving as a switching unit of said relay means,

wherein said packet transfer apparatus ~~performs mutual convertssion between the~~
~~packet transmitted/received by said access network and into~~ the superpacket ~~and visa versa~~
~~transferred on said network, and further~~ transfers the packet transmitted from a transmission-
source access network to a destination access network in a form of the superpacket through said
relay means in said network.

19. (Currently Amended) A system according to claim 18, wherein
said packet transfer apparatus and said relay means are assigned unique network
addresses defined only in said network, and
said network addresses of packet transfer apparatuses ~~connected to said~~
~~transmission source and destination access networks~~ are stored in a header of the superpacket as
a transmission-source address and destination address.

20. (Original) A system according to claim 19, wherein for superpackets having the
same destination packet transfer apparatus, different network addresses are assigned to
destination addresses in headers of the superpackets in accordance with a type of destination
access network connected to said destination packet transfer apparatus.

21. (Currently Amended) A system according to claim 19, wherein said relay means
comprises:

a route search table which stores a number of entries, in said number of entries at
~~least number~~ corresponding to ~~the~~ a numbers of said packet transfer apparatuses and relay
means, each of said entries ~~making~~ connects a destination address in a header of the
superpacket ~~correspond~~ to a relay destination of the superpacket, and

route search means for searching the route search table on the basis of the destination address in the header of the superpacket to specify-find the relay destination of the superpacket.

22. (Currently Amended) A system according to claim 18, wherein for ~~the~~ same network flow ~~as a traffic~~, through said relay means in said network, from said packet transfer apparatus connected to said transmission-source access network to said packet transfer apparatus connected to said destination access network, superpackets corresponding to the same network flow have the same header.
